DATA-CONTROL SYSTEMS, INC.

INSTRUCTION MANUAL
GSA-5/GSA-6
LINE DRIVING AMPLIFIERS

102

INSTRUCTION MANUAL
GSA-5/GSA-6
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DOCUMENT NO:	Published:
690815A	12/70
690815B	10/72
	08/74
690815C	04/77
690815D	06/78

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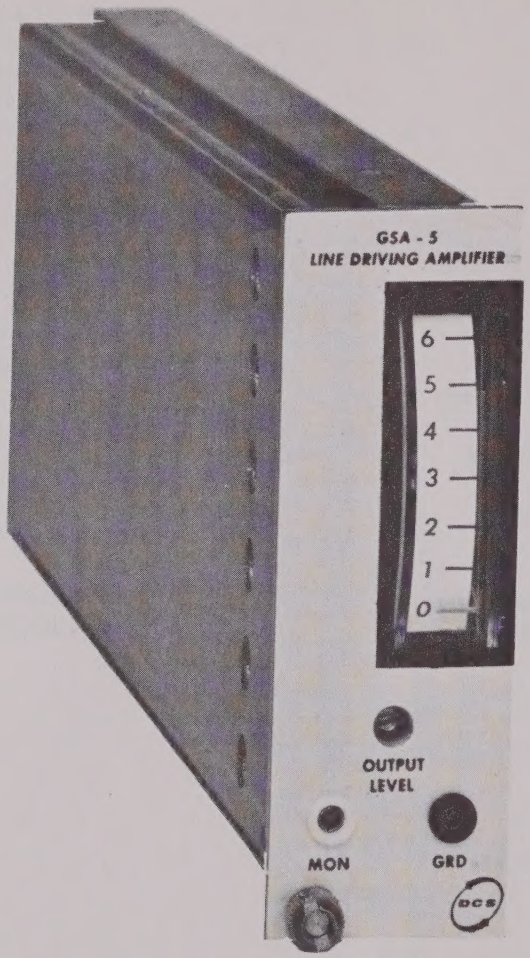


Figure 1-1. Model GSA-5 Line Driving Amplifier

SECTION I

INTRODUCTION

1-1. GENERAL.

1-2. This publication contains information necessary for understanding, operating and maintaining the Models GSA-5 and GSA-6, Line Driving Amplifiers (Figure 1-1), designed and manufactured by Data-Control Systems, Inc., Commerce Drive, Danbury, Connecticut.

1-3. This information is presented in the following sections: Section I - Introduction; Section II - Operation; Section III - Theory of Operation; Section IV - Maintenance; Section V - Parts List and Section VI- Drawings.

1-4. The GSA-5 and GSA-6 are the same except that the GSA-6 does not include a front panel meter and its associated circuitry. Since the GSA-5 and GSA-6 are alike except for the meter circuit, the designation GSA-5/GSA-6 will be used throughout this manual. Areas of discussion which are not applicable to the GSA-6 will be noted.

1-5. PURPOSE AND SCOPE.

1-6. The Model GSA-5/GSA-6 is a wide band amplifier designed for summing frequency spectra ranging up to 10 MHz or the single high frequency output of a Voltage Controlled Oscillator (VCO). Channels or modulators may be added or removed without circuitry change since the summing networks are arranged to maintain the amplitude of the input signal, for each channel, at the desired level. This results in a constant peak-to-peak (pp) output capable of driving a 51 ohm load, independent of the number of channels. A reference frequency may be summed with the multiplex through an internal buffer amplifier, permitting the addition of a reference tone to any number of multiplexes. Figure 1-2 shows a typical system utilizing the GSA-5/GSA-6.

1-7. PHYSICAL CHARACTERISTICS.

1-8. The physical characteristics of the GSA-5/GSA-6 are as follows:

Mounting:
Mounts in a single module space of the DCS Model GMA, Module Assembly/Power Supply. Up to 14 GSA-5/GSA-6's may be mounted in a single GMA. Units are locked into place with a captive screw.

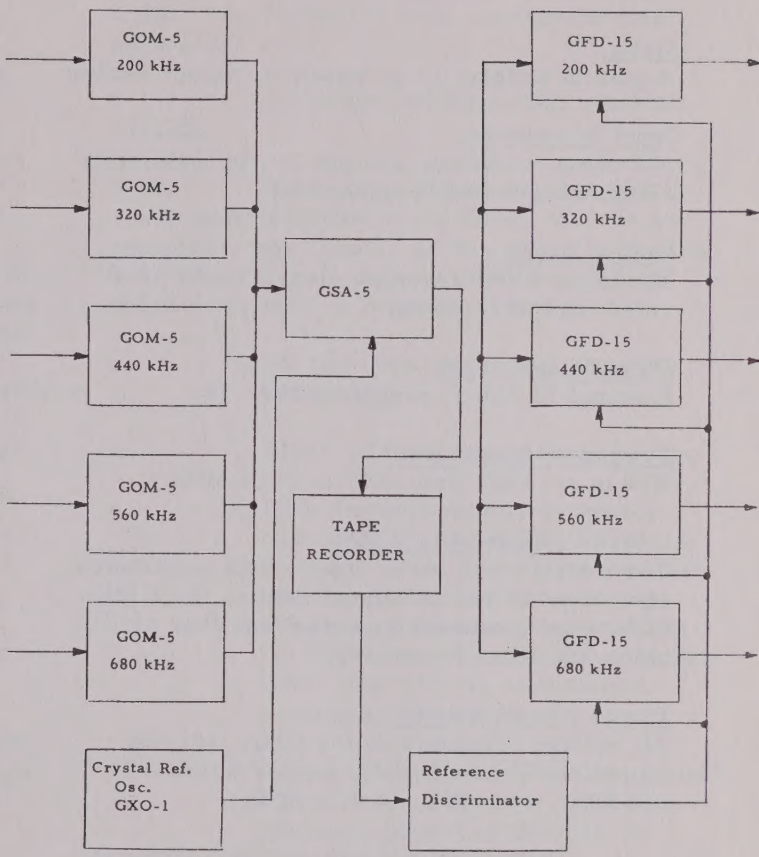


Figure 1-2. Typical 5 Channel Constant Bandwidth System.

Dimensions:
1.14" (2.9 cm) wide X 3.29" (8.36 cm) high X 10.5" (26.7 cm) long.

Weight:
14 ounces (396 grams).

Connectors:
All connections to GMA through Elco Varicon connectors.

Cooling:
Forced air ventilation provided by GMA.

Front Panel Color:
Aluminum with black lettering.

Front Panel Indicators & Controls:
Output level adjust. Output monitor. Ground. Output level meter, VPP)GSA-5 only).

1-9. ELECTRICAL CHARACTERISTICS.

1-10. The electrical characteristics of the GSA-5/GSA-6 are as follows:

Gain:
A gain of at least 20 at maximum output setting.

Input Impedance:
500 ohms, nominal, shunted by approximately 120pf, single-ended, grounded.

Output Level:
Maximum 6VPP for open circuit or 3VPP at rated load of 51 ohms.

Output Impedance:
Nominal 51 ohms, single-ended. 15

Frequency Response:
Within +1-3 dB from 200 Hz to 10 MHz.

Intermodulation Distortion:
For 4 MHz and 5 MHz, inputs with amplitudes equivalent to normal signal inputs, the 1 MHz difference frequency remains less than 40 dB below the other two terms.

Power Requirements:
All voltages supplied by the GMA, Module Assembly/Power Supply, are as follows: ±18 VDC, +12 VDC and +35 VDC.

1-11. All connections to the GSA-5/GSA-6 are made in the rear of the module through an Elco Varicon connector. Elco pin connections and functions are called out in Table 1-1.

Table 1-1. Elco Pin Connections.

Pin #	Designation
1	No connection
2	No connection
3	No connection
4	+12V
5	Ground
6	Summing Bus (Input)
7	-12V
8	-35V
9	+18V Unregulated
10	-18V Unregulated
11	Reference Frequency Out
12	Ground
13	Reference Frequency In
14	Ground
15	No connection
16	No connection
17	No connection
18	No connection
19	Output
20	Ground

SECTION II

OPERATION

2-1. GENERAL.

2-2. This section describes the operating procedure for the GSA-5/GSA-6.

2-3. INSTALLATION.

2-4. UNPACKING & HANDLING. The unit is sealed in a moisture proof polyethelene blister pack assembly and insulated from shock during shipment with packing material. Remove the corrugated carton and packing material and perform a general visual inspection. Retain carton and covering until inspection is completed.

2-5. MOUNTING. The GSA-5/GSA-6 is designed to be mounted in a DCS GMA, Module Assembly/Power Supply, which contains the proper wiring for interconnection. To install the GSA-5/GSA-6 proceed as follows:

a. Check the wiring diagram for your GMA to establish the slots which are properly wired to accept the GSA.

b. Insert the GSA into the proper slot and apply pressure until connectors engage.

c. Rotate the captive screw until it is completely installed.

2-6. COOLING. Each GMA, Module Assembly/Power Supply, is equipped with a muffin fan which pressurizes to 0.2" of water and forces cooling air over the GSA, stabilizing its operating temperature.

2-7. LUBRICATION. The GSA-5/GSA-6 requires no lubrication. See GMA manual for lubrication instructions.

2-8. OPERATING CONTROLS & INDICATORS & CONNECTORS.

2-9. Table 2-1 lists the front panel controls and indicators.

2-10. Table 1-1 lists connectors (See page 1-2.)

2-11. GENERAL OPERATING PROCEDURES.

2-12. It is assumed that the unit has already been installed in the GMA, Module Assembly/Power Supply, as described in Section 2-5. See Figure 1-1 for a front panel view. To operate the unit, proceed as follows:

a. Set the GMA power switch to the ON position.

b. Allow a 15 minute warmup period.

c. With the rack blower assembly switch OFF, check the air flow at the GMA panel openings to be sure that the muffin fan is operating. (When modules are missing from the GMA, use Blank Panels, Model GBP-1 or GBP-2, to maintain cooling air pressure.)

d. Adjust the Output Level Control full clockwise and apply a 100 kHz, 300 mvpp signal to the GSA-5/GSA-6 input (Elco pin 6).

e. Monitor the output (Elco pin 19) for a signal greater than 6 VPP and, while varying the Output Level Control, observe the output amplitude changing.

f. Apply a 100 kHz 600 mvpp signal to input (Elco pin 13) and monitor output (Elco pin 11) for a signal of approximately 600 mvpp.

g. In order to turn the GSA off, it is necessary to throw the GMA power switch OFF or loosen the captive screw and disengage the module.

Table 2-1. Front Panel Controls & Indicators.

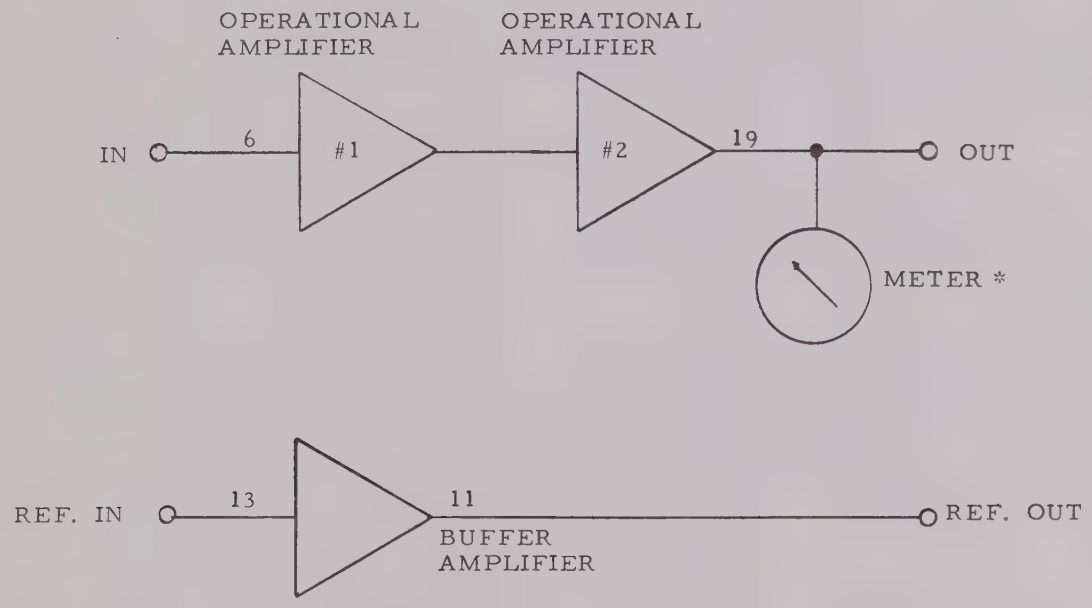
Control/Indicator	Location	Function
Output Monitor Jack	Lower left	Monitors output signal.
Output Level Control	Lower center	Adjusts output signal level.
Output Meter (GSA-5 only)	Center	Indicates output VPP.
Ground Monitor	Lower right	Monitors ground signal.

SECTION III

THEORY OF OPERATION

3-1. GENERAL.

3-2. This section describes the theory of operation of the GSA-5/GSA-6 with reference to the Functional Block Diagram (Figure 3-1) and the Schematic Drawing (TW-017655/TW-018627), contained in Section VI.



* GSA-6 has no meter

Figure 3-1. Model GSA-5/GSA-6 Simplified Functional Block Diagram

3-3. THEORY OF OPERATION.

3-4. The GSA-5/GSA-6 consists of two operational amplifiers connected in cascade, a meter circuit across the output for peak-to-peak readings (not applicable to the GSA-6) and a buffer amplifier to accept a separate reference input signal (See Figure 3-1.).

NOTE

Any reference to the meter circuitry does not apply to the GSA-6.

3-5. OPERATIONAL AMPLIFIER #1. The first operational amplifier (consisting of Q101, Q102, Q103 and Q104) is fed an input multiplex signal through C128, R301, C101, R101 and R102 into the base of Q101. R301 (Output Level Control) controls the output amplitude of the GSA.

3-6. The signal is transferred to the emitter of Q103 (the base of this transistor is held at a constant DC voltage by the zener action of Q102), fed into the base of Q104 and taken from emitter of Q104.

3-7. The total gain of this stage is determined by the ratio of R106 and R101. In the schematic, R106 is 5.11K ohms and R101 is 1K ohm. The ratio of these resistors is approximately 5:1 and the gain of the stage is 5.

3-8. OPERATIONAL AMPLIFIER #2. The second operational amplifier consists of Q105 through Q113. Transistors Q105, Q106 and Q107 serve the same functions as Q101, Q102 and Q103, respectively.

3-9. The output of Q107 feeds Q108, an NPN transistor, and simultaneously drives Q110, a PNP transistor. Emitter follower, Q108, provides parallel inputs to Q109 and Q111. Emitter follower, Q110, drives Q112 and Q113.

3-10. Q109 and Q111 comprise one side of a push-pull amplifier and Q112 and Q113 the other side. A portion of the output of this amplifier is fed back to the input via R115, and, together with R113, determines the gain of the stage.

3-11. The output of the amplifier is fed into the RC cirsuit, R135, C112 and C113, and then applied to the output via Elco pin 19 of the GSA connector.

3-12. (Not applicable to GSA-6). The metering circuit consists of Q114 and CR101. It is connected between the output and ground and measures the peak-to-peak output voltage as applied to Elco pin 19.

3-13. A buffer amplifier consisting of Q115 and Q116 with an independent input and output is used to add a reference signal to the multiplex input if desired. A high input impedance is provided by Q115 (FET) and the overall gain of the amplifier is unity.

SECTION IV

MAINTENANCE

4-1. GENERAL.

4-2. This section covers general maintenance and troubleshooting for the GSA-5/GSA-6. The location of major components is referenced in assembly drawing RA-017722 (RA-018626), contained in Section VI and in Figure 4-1.

4-3. TEST EQUIPMENT.

4-4. Test equipment is listed in Table 4-1.

Table 4-1. List of Test Equipment

Nomenclature	Characteristics
Oscillator	HP 651A*
Volt Meter	HP 400CD*
Resistance Decade Box	Eico 1171*
Oscilloscope	Tektronix 535*
Volt Ohmmeter	Simpson 260*
Frequency Counter	TSI 373/R*
GTF-2	DCS Test Fixture

4-5. PREVENTIVE MAINTENANCE.

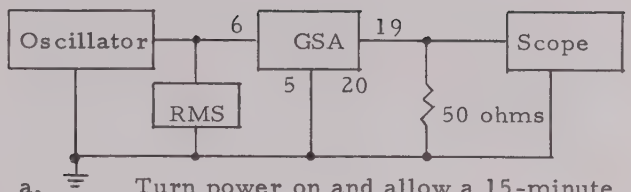
4-6. VISUAL INSPECTION. Remove the cover and inspect all elements for physical signs of damage such as broken or leaking components, burned or charred spots on resistors or capacitors, loose or oxidized soldered wires and spread or bent Elco pins.

4-7. CLEANING. Since cooling air is constantly flowing through the equipment, the main blower rack should be properly filtered. The rack should be cleaned periodically with a standard vacuum cleaner. Panel and covers may be cleaned with a suitable solvent, such as carbon met. Interior parts must be air blown.

4-8. MINIMUM PERFORMANCE TESTS.

4-9. The minimum performance tests required to ensure proper operation of the equipment are described in this section. If performance falls below operating specifications, the cause must be determined through trouble-shooting procedures.

4-10. INPUT LEVEL. Set up the equipment as shown and proceed as follows: (Insert the GTF-2 into the GMA and plug the GSA into the GTF-2)



a. Turn power on and allow a 15-minute stabilization period.

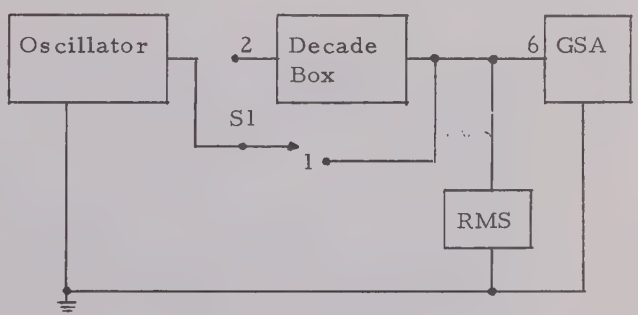
b. Set the oscillator to any frequency between 200 Hz and 10 MHz with an amplitude of 0.1V RMS.

c. Set the OUTPUT LEVEL adjust fully clockwise.

d. Increase output level until waveform on scope becomes distorted.

e. Input level on RMS meter should be greater than 110 mv RMS which corresponds to approximately 300 mvpp.

4-11. INPUT IMPEDANCE. Set up the equipment as shown below and proceed as follows:



a. Set the output level adjust fully clockwise.

b. Set the resistance decade box for 500 ohms.

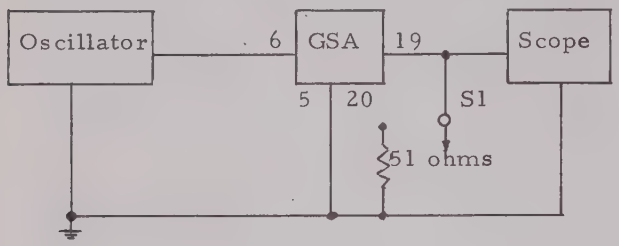
c. Set the oscillator to 1 kHz with a level of 0.1V RMS.

d. With S1 in the #1 position, record the voltage indicated on the RMS meter.

e. With S1 in the #2 position, select a resistance value which will be equal to $\frac{1}{2}$ of the voltage recorded in Step C.

f. The input impedance can now be read directly from the decade box with a nominal value of 500 ohms.

4-12. OUTPUT LEVEL. Connect the equipment as shown below and proceed as follows:



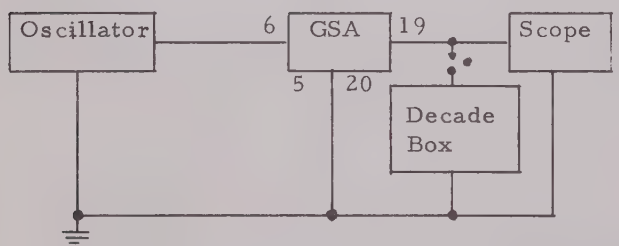
a. Set the oscillator to any frequency between 200 Hz and 10 MHz.

b. Set the OUTPUT LEVEL ADJUST on the GSA fully clockwise.

c. Increase the input amplitude until the waveform becomes distorted.

d. With S1 in the open position, the waveform shall be greater than 3VPP.

4-13. OUTPUT IMPEDANCE. Connect the equipment as shown below and proceed as follows:



a. Set the oscillator to 1 kHz and level to 0.1V RMS.

b. With S1 in the open position, record the voltage indicated on the RMS meter.

c. With S1 in the closed position, select a resistance that will give $\frac{1}{2}$ the reading in step B.

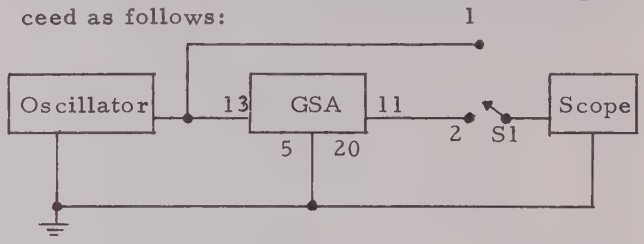
d. The output impedance can now be read directly from the decade box with a nominal value of 50 ohms.

4-14. FREQUENCY RESPONSE. Connect the equipment as shown in paragraph 4-10 and proceed as follows:

a. While maintaining a constant input level of 0.1V RMS, vary the oscillator from 200 Hz to 10 MHz.

b. The amplitude variation will remain within ±3 dB range.

4-15. BUFFER AMPLIFIER OUTPUT LEVEL. Connect the equipment as shown below and proceed as follows:



a. Set the oscillator to any frequency between 200 Hz and 10 MHz.

b. With S1 in the #1 position, the waveform shall be equal to approximately 600 mvpp.

c. With S1 in the #2 position, the waveform shall be equal to approximately 600 mvpp.

4-16. TROUBLESHOOTING.

4-17. Troubleshooting the GSA module consists of injecting a signal into the input of the GSA and tracing this signal through its stages.

4-18. Remove the defective GSA from the GMA and remove the cover from the GSA. Insert the GTF-2, Test Fixture, into the GMA and plug the GSA into the test fixture.

4-19. Apply a 1 kHz, 0.1V RMS signal to Elco Pin 6 of the GSA. With the scope, monitor terminal E111 (See schematic and board assembly) and check for signal at this point.

4-20. If no signal is present at terminal E111, adjust potentiometer R301 clockwise. If the applied input signal does not appear, check R301 and C128 with an ohmmeter.

4-21. With the input signal present at terminal E111, monitor terminal E110 and check for a 1 kHz, 0.5V RMS (approximate) signal. If no signal is present at terminal E110, check Q101 through Q104.

4-22. With the proper signal at terminal E110, monitor terminal E107 for a 1 kHz, 2.5V

RMS (approximate) signal. If no signal is present at terminal E107, check Q105 through Q113.

4-23. The meter circuit consists of two active components, Q114 and CR101. If the meter does not function properly, check these two components with an ohmmeter.

CAUTION

Do not check across the meter movement (terminals E105 and E106) with an ohmmeter as the internal battery may destroy the meter movement.

4-24. Apply a k kHz, .5V RMS (approximate) signal to Pin 13 on the GSA (the input to the buffer amplifier) and check for this signal on Pin 11 (the output of the buffer amplifier). If no signal is present in Pin 11, check Q115 and Q116. (Not applicable to GSA-6)

4-25. After the defective GSA has been repaired, perform the minimum performance tests as previously described.

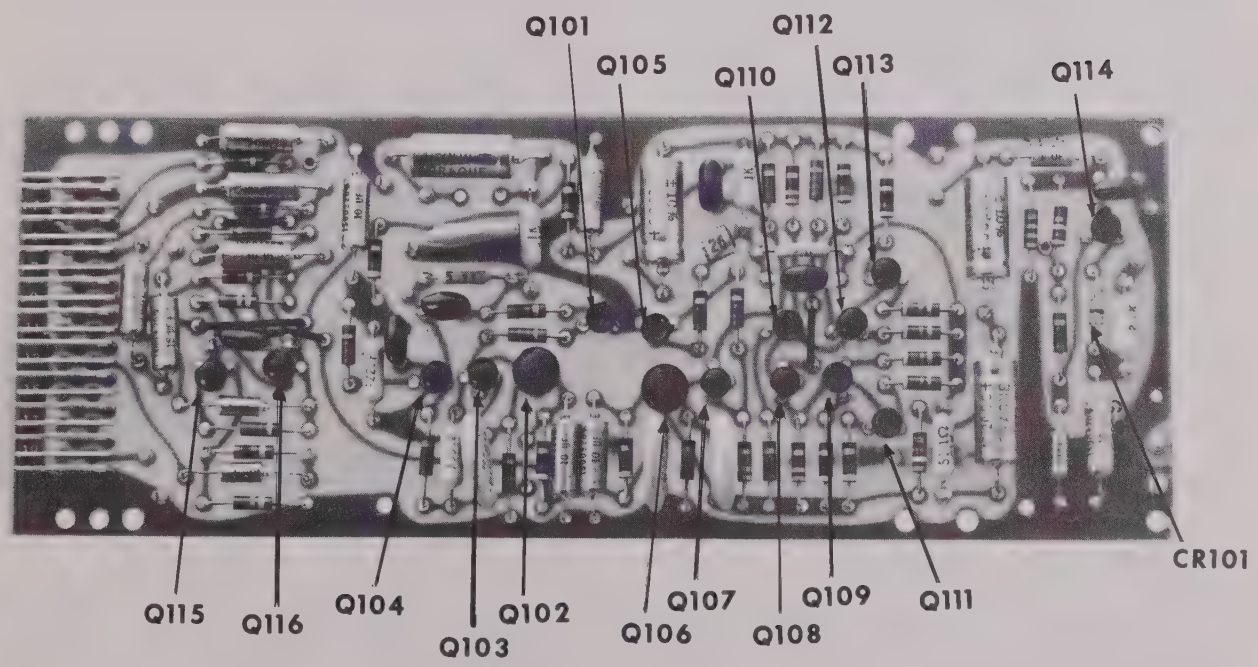


Figure 4-1. GSA-5/GSA-6 With Major Components Called Out

NOTE: Components within dotted lines do not apply to the GSA-6

SECTION V

PARTS LIST

5-1. INTRODUCTION.

5-2. This parts list section includes all pertinent data necessary to locate, identify and procure additional parts for the equipment. Parts are listed alpha-numerically by reference symbol and include all electronic items. In some cases, values, ratings and manufacturer sources shown are nominal and variations may be found. Satisfactory replacement may be made with either the listed component or an exact replacement of the part described in this list.

5-3. ORDERING INFORMATION.

5-4. The following instructions will aid in ordering parts from the parts list.

a. Address all inquiries or orders to:
Field Service Department
Data-Control Systems, Inc.
Commerce Drive
Danbury, Connecticut 06810

b. Include the following information:

(1) Model and Serial number of instrument and assembly.
(2) Data-Control Systems part number.
(3) Reference Symbol Number.
(4) Description (as shown on list).
(5) Description of Assembly (such as center frequency, deviation, cutoff frequency and filter type.)

5-5. HOW TO USE THE PARTS LIST.

5-6. Paragraphs 5-7 through 5-11 describe the use and meaning of the five columns included in the parts list.

5-7. REF SYMBOL COLUMN. The Ref. Symbol column contains an alpha-numerical listing of parts as they appear on equipment chassis, illustration, or schematic. The reference designation identifies the parts as to their component function in the instrument.

5-8. DESCRIPTION COLUMN. The Description column contains the identification of component parts including all pertinent specifications. When the description column is used for a part which is identical to a part which has already been described, reference is made to the identical part, and the remaining columns remain blank. In some instances, the part is selected to provide the required characteristics of the assembly, such as tuning unit center frequency and deviation and low pass filter cutoff frequency and filter characteristics. These parts are identified as "factory selected value". For these parts, it is not feasible to list the electrical characteristics of the part. Replacement of these parts should always be by an identical part, identification should be from the replaced part or by providing full information as specified in paragraph 5-4b(5).

5-9. MANUFACTURER'S PART NUMBER COLUMN. The Manufacturer's Part Number column contains the part number or type number as designated by the manufacturer of the part.

5-10. MANUFACTURER COLUMN. This column lists the true manufacturer of the part (vendor or DCS) except where the part is selected for particular characteristics by DCS. In this case, DCS is listed as the manufacturer and replacement must be made by DCS part number.

5-11. TOTAL QTY COLUMN. The Total Qty column contains the number of identical parts in the equipment. This total does not include parts selected for specific characteristics (such as center frequency) since these quantities vary among different assemblies.

PARTS LIST (GSA-5/GSA-6)

Ref. Symbol	Description	Manufacturer	Mfr's. Part #	Total Qty.
Unit Series	Board	DCS	DF-017636	1
C101	Capacitor, Fixed, 10%, 47μf	Sprague	150D	4
C102	Capacitor, Fixed, Factory Selected Value Nominal value 1pf	Durmica	DM-10	2
C103	Capacitor, Fixed, 100V, .1μf	RMC	TA	4
C104	Capacitor, Fixed, 20V, 10μf	Sprague	150D	8(7)
C105	Capacitor, Fixed, 1%, 15pf	Durmica	DM-10	2
C106	Same as C104			
C107	Same as C101			
C108	Same as C102			
C109	Same as C104			
C110	Same as C103			
C111	Same as C104			
C112-113	Same as C101			
C114*	Capacitor, Fixed, 10%, 1μf	Sprague	150D	4(3)
C115*	Capacitor, Fixed, Factory Selected Value Nominal value 100pf	Durmica	DM-10	
C116*	Same as C114			
C117*	Same as C104			
C118-120	Same as C104			
C121-122	Same as C114			
C123	Same as C105			
C124-125	Same as C103			
C126-127	OMIT			
C128	Capacitor, Fixed, 20V, 15μf	Sprague	150D	2
C129	Capacitor, Fixed, Factory Selected Value Nominal value 5pf	Durmica	DM-10	
C130	Same as C128			
CR101*	Diode	CTP	700A	1(0)
CR104	Diode	GE	F16H1	2
CR106	Same as CR104			
R101	Resistor, Fixed, Factory Selected Value Nominal value 1K ohm			
R102	Resistor, $\frac{1}{4}$w, 10%, 100 ohm	Allen Bradley	CB	5
R103	Resistor, $\frac{1}{4}$w, 10%, 180 ohm	Allen Bradley	CB	4

NOTE: * indicates in GSA-5 only. Numbers in ( ) indicate different quantity for GSA-6.

Ref. Symbol	Description	Manufacturer	Mfr's. Part #	Total Qty.
R104	Resistor, ¼w, 10%, 47 ohm	Allen Bradley	CB	8
R105	Resistor, ½w, 10%, 5.6K	Allen Bradley	CB	1
R106	Resistor, Fixed, Factory Selected Value Nominal value 5.11K			
R107	Resistor, Fixed, ¼w, 1%, 750 ohm	Electra	MF5CD	1
R108	Resistor, Fixed, ¼w, 10%, 2.2K	Allen Bradley	CB	1
R110	Resistor, Fixed, ¼w, 1%, 4.22K	Electra	MF5CD	1
R111	Same as R103			
R112	Same as R104			
R113	Same as R101			
R114	Same as R102			
R115	Resistor, Fixed, Factory Selected Value Nominal value 5.11K			
R116	Same as R103			
R117	Same as R105			
R118	Resistor, Fixed, ¼w, 10%, 330 ohm	Allen Bradley	CB	1
R119	Same as R104			
R120	Resistor, Fixed, ¼w, 10%, 3.3K	Allen Bradley	CB	2
R121	Resistor, Fixed, ¼w, 10%, 1.5K	Allen Bradley	CB	1
R122	Same as R103			
R123	Same as R104			
R124	Same as R120			
R125-126	Same as R104			
R127-130	Resistor, Fixed, ¼w, 10%, 4.7 ohm	Allen Bradley	CB	4
R131	Same as R104			
R132	Resistor, Fixed, ¼w, 10%, 150 ohm	Allen Bradley	CB	1
R133	Same as R104			
R134	Resistor, Fixed, ¼w, 10%, 39K	Allen Bradley	CB	1
R135	Resistor, Fixed, ¼w, 1%, 51.1 ohm	Electra	MF5CD	1
R136*	Resistor, Fixed, ¼w, 10%, 470K	Allen Bradley	CB	1
R137*	Resistor, Fixed, ¼w, 10%, 33K	Allen Bradley	CB	1
R138*	Resistor, Fixed, ¼w, 10%, 1K	Allen Bradley	CB	1
R139*	Resistor, Fixed, Factory Selected Valeu Nominal value 12.7K			
R140	Same as			
R141	Resistor, Fixed, ¼w, 10%, 12K	Allen Bradley	CB	1

Ref. Symbol	Description	Manufacturer	Mfr's. Part #	Total Qty.
R142	Resistor, Fixed, ¼w, 10%, 680 ohm	Allen Bradley	CB	1
R143	Resistor, Fixed, ¼w, 10%, 22K	Allen Bradley	CB	1
R144	Resistor, Fixed, ¼w, 10%, 2.2K	Allen Bradley	CB	1
R145	Same as R102			
R146	Resistor, Fixed, Factory Selected Value Nominal value 100 ohm			
R147	Same as R102			
Q101	Transistor	GE	2N3856A	
Q102	OMIT			
Q103-104	Transistor	NSC	2N4250	
Q105	Same as Q101			
Q106	OMIT			
Q107-108	Same as Q103			
Q109-111	Same as Q101			
Q112-113	Same as Q103			
Q114*	Same as Q101			
Q115	Transistor, F.E.T.		2N5163	
Q116	Same as Q103			
	FRONT PANEL			
M301*	Meter	DCS	BD-008923	1
R301	Resistor, Variable, 1K ohm	Allen Bradley	GA2G024S-102-UA	1

SECTION VI

DRAWINGS

6-1. GENERAL.

6-2. The drawings listed in this section are furnished to supplement the text.

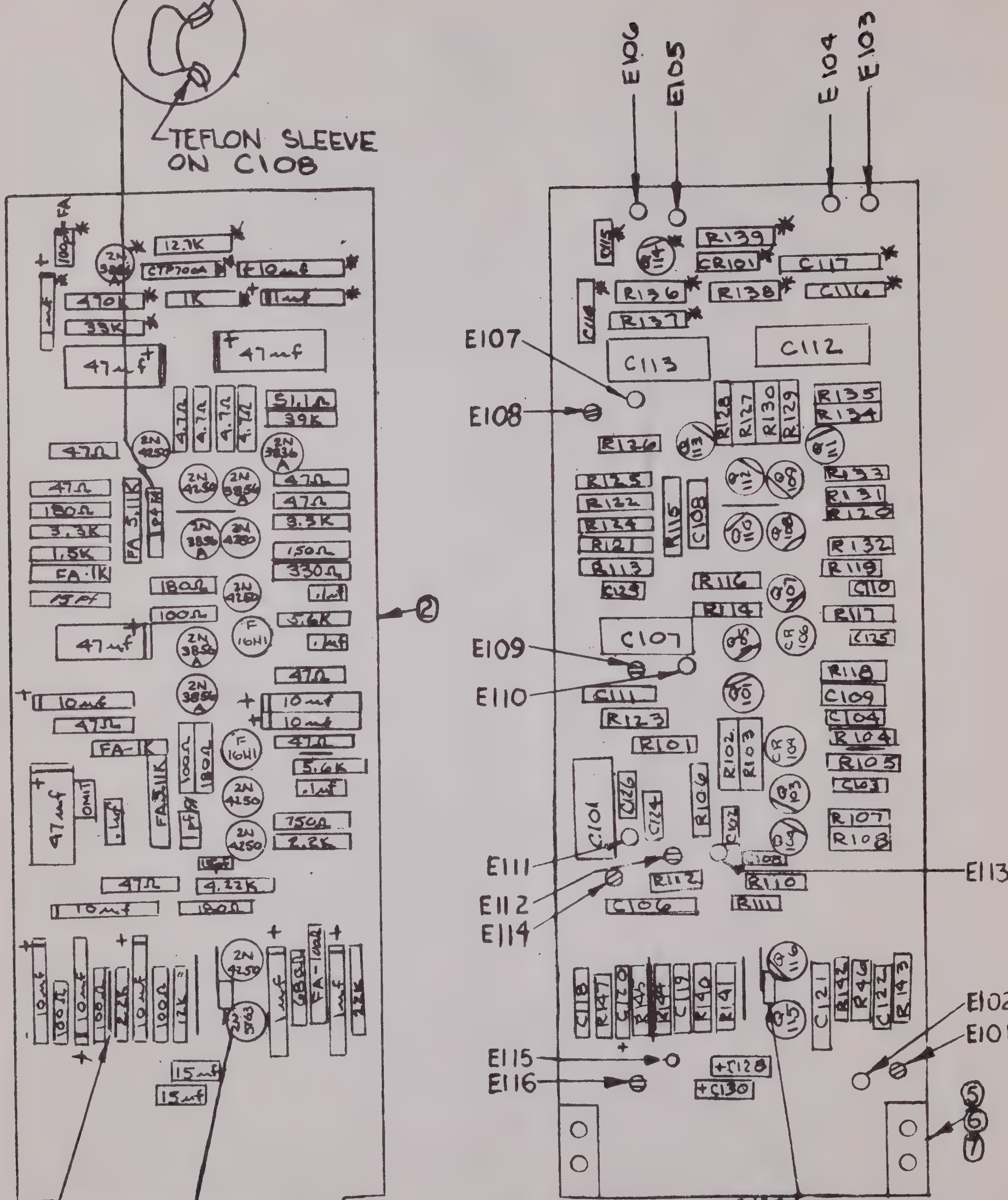
6-3. DRAWING LIST.

Drawing numbers in ( ) refer to the GSA-6.

017722 Board Assembly, GSA-5/GSA-6
(018626)

017655 Schematic, GSA-5/GSA-6
(018626)

017656 Outline Drawing, GSA-5/GSA-6


TEFLON SLEEVE ON C108
E106
E105
E104
E103
E107
E108
E109
E110
E111
E112
E113
E114
E115
E116
E102
E101
R139
CR101
C117
R136
R138
C116
R137
C113
C112
R135
R134
R126
R125
R122
R121
R113
R116
R114
C107
R133
R131
R132
R119
C110
R117
C125
R118
C109
C104
R104
R105
R123
R101
C101
R112
R110
C106
C121
+C128
+C130
C129
12.7K
1K
47 mf
51.1Ω
39K
47Ω
180Ω
3.3K
1.5K
FA-1K
2N 4250
2N 3856 A
F 16H1
10 mf
5.6K
.1 mf
150Ω
330Ω
750Ω
2.2K
4.22K
100Ω
15 mf
OMIT
2N 3563
5pfFA
2
3
4
5
6
7

DATA CONTROL SYSTEMS, INC.	BD ASSY, MASTER BOARD RA 017722 (Rev. L)/ AA-018626 (Rev. D)
GSA-5/GSA-6	

REV.	DESCRIPTION	DATE	DWN.	CHK.	APP.
B	ADDED CAP C-127 PER CA-4433	3/22/66	JH	MR	DR
C	CHG R135 TO 67.1Ω PER CA-4434	5/24/66	DR	MR	DR
D	CA 4452 REVISED	7-12-66	JH	DR	DR
E	CA 4614 CHGD RES VALUES	7-16-66	JH	DR	DR
F	CA-4625 ADD C130	7-16-66	DR	DR	DR
G	CA-4999, CHGD CAP. C102	2/1/67	DR	DR	DR
H	CA-5057, CHGD CAP. C108	5-7-68	DR	DR	
J	CA-5593, ADD CR106, CR109 DELETE CR102, CR105	8-31-68	PCH		

ITEM	SYMBOL	DWG. NO.	DESCRIPTION	QTY. PER UNIT

QTY	DESCRIPTION

NOTE:
1.) ALL RES. ¼W AB CB. 10% UNLESS OTHERWISE MARKED
2.) ALL UNMARKED CAPACITORS ARE 20%.
3.) METER CIRCUIT IN GSA-5 ONLY.

DATA CONTROL SYSTEMS, INC.

TITLE: SCHEMATIC, GSA-5, GSA-6

TOLERANCES UNLESS OTHERWISE SPECIFIED: DECIMAL - 3 PLACE ± .005; DECIMAL - 2 PLACE ± .010; FRAC ± 1/64 ANG ± 0°30'; FLATNESS WITHIN .001/IN.; FRACTIONAL HOLES Ø + 1/64; NOTE- BREAK ALL SHARP CORNERS .005" - .015"; SURFACE ROUGHNESS NOT TO EXCEED

DWN	J.E. HOLZE	DATE 3-1-68
CHKD		
ENG		
APP		
SCALE		

DO NOT SCALE DRAWING

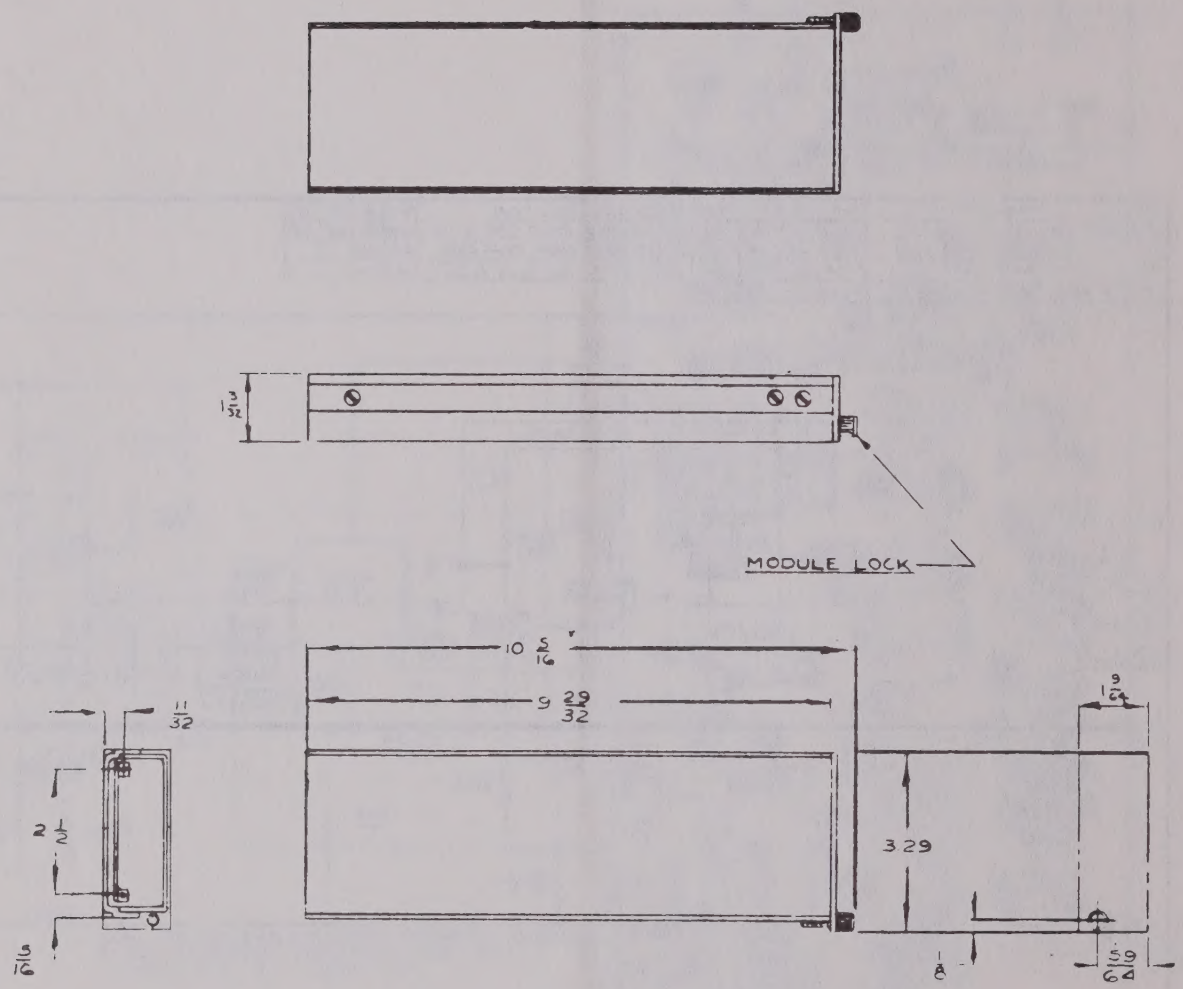
MATL —

FINISH —

FIRST PRODUCT	NEXT ASSEMBLY	QTY.

TW | C1T655 (01862 7) | REV. J (C)

SHEET



TOLERANCES: UNLESS OTHERWISE SPECIFIED
DECIMAL - 3 PLACE ± .005
DECIMAL - 2 PLACE ± .010
FRAC. ± 1/64 ANG. ± 0°30'
FLATNESS WITHIN /IN.
FRACTIONAL HOLES -0. + 1/64
NOTE: BREAK ALL SHARP CORNERS .005"-.015"

DATA CONTROL SYSTEMS, INC.

OUTLINE, GSA-5
CO-017656(Rev. B)